

Knowledge level of extension agents on nutrition-sensitive agricultural services in rural communities in Kwara State, Nigeria

Lateef Lawal Adefalu^{ID1}, Sidiqat A. Aderinoye-Abdulwahab^{ID1*}, Oyinkansola O. Alawode^{ID1}
 Humera Amin² and Sikiru Ibrahim-Olesin^{ID3}

¹Department of Agricultural Extension and Rural Development, University of Ilorin, Nigeria; ² Department of Sociology and Criminology, University of Sargodha, Pakistan; ³ Department of Agriculture, Alex Ekwueme Federal University, Ndufu-Alike, Ebonyi State, Nigeria

*Corresponding author's e-mail: aderinoye.as@unilorin.edu.ng

The knowledge level of nutrition-sensitive extension services to rural people remains unknown in Kwara State, Nigeria while hunger and malnutrition are still major problems affecting developing countries; hence, the need for a holistic appraisal that can alleviate the nutrition anomaly. Extension agents play an important role in rural dwellers' lives by disseminating valuable information that can improve their production and enhance their livelihoods. This study selected 120 extension agents and collected data with a questionnaire which was analyzed with descriptive and inferential statistics. Findings revealed that 66.7% of the extension agents were males and 92.5% were married, with average farming families of 6,096 covered by each agent. Results also showed that 48.3% of the agents have 6-10 years of working experience and their major sources of nutrition information were personal experience, agricultural extension institutes, friends and colleagues, fortnight training meetings, and seminars/workshops. They have more knowledge of protein foods, calcium foods, cassava processing and vitamin supplements but little understanding of preparation of nutritious dishes, sources of iodine, and cheap protein and vitamin D sources. Insufficient EAs, inadequate staff mobility, poor EA-nutrition expert linkage, poor access to information on nutrition and lack of training incentives highly constrained them. At P=0.05, age was a basic determinant of respondents' knowledge on nutrition-sensitive extension. Though the EAs knew protein foods, but they still need information on iodine, vitamin D and cheap protein sources. The study recommended provision of training incentives and adequate access to information to boost their knowledge on nutrition-sensitive extension.

Keywords: Hunger and malnutrition, vitamin supplements, iodine deficiency, minerals, rural livelihoods, poverty and hunger.

INTRODUCTION

Poverty, hunger, and hidden hunger have been identified as major problems affecting many countries worldwide, hence the need for a holistic solution to alleviate or solve this nutrition anomaly ([Tochukwu 2022](#)). According to the [WHO, UNICEF and WB \(2021\)](#), stunting in children under the age of 5 was 22% (149.2million), 13.6% (45.4million) of children under the age of 5 were wasted while overweight children under the age of 5 were 5.7% (38.9 million) in 2020. [FAO, IFAD, UNICEF, WFP and WHO \(2019\)](#) stressed that about 820 million people globally are still plagued by hunger, which poses a stumbling block to achieving the SDG 2030 target of zero hunger. It added that more than 2 billion people globally face a severity of food insecurity; and the inability to have required access to sufficient and nutritious food by these populations

exposes them to malnutrition and unhealthiness. While the level of hunger and malnutrition is of little significance (8%) across Europe and Northern America, the scourge is concentrated primarily in low and middle-income countries, with a higher rate among women group than men ([Grosso et al., 2020](#)). According to [WHO \(2020\)](#), having access to safe and nutritious food is necessary to enhance good health, life and well-being. Moreover, beyond food security, adequate nutrition in foods, including micronutrient availability, is of immense concern. Poverty and food insecurity have been greatly associated with malnutrition despite the importance of the consumption of rich foods ([Siddiqui et al., 2020](#)). More pressing, however, is hidden hunger or micronutrient deficiencies which is a component of malnutrition ([Gödecke et al., 2018](#)) and its identification with all categories of ages ([Heltberg, 2009](#)). That is why there has been a global call

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within governments and development institutions about the need for a greater awareness on the understanding of the links between nutrition and agriculture, and to carve out ways through which the sector can be instrumental in improving nutrition (FAO 2013; FAO 2017a).

According to the estimation of African Food Security Briefs (AFSB), in every three persons present in sub-Saharan Africa, one of them is undernourished (Akerele *et al.*, 2013). Matemilola and Elegbede (2017) have equally argued that without bridging the nutrition requirement gap, it will remain difficult to ensure sustainability in Africa's economic development (Nigeria inclusive). Despite the prevalence of agricultural production in rural areas, FAO (2015) has noted that many rural people are poor, with food insecurity, under-nutrition, and little access to markets and essential services. It has equally been argued that adequate and nutritious food would improve health status by offering complete physical, mental and social well-being (Enemuoh, 2013). In the same vein, nutritious diets can reduce the occurrence of diseases or infirmity while it is also a major determinant of the socio-economic development of people (Musah and Kayode, 2014). People select and eat foods with pleasurable taste while nutrition remains, perhaps, the most important problem facing the poor in the world. In spite of the progress made in improving nutrient availability in the last decade, a large proportion of poor households in developing countries still have inadequate access to sufficient and nutritious foods (Adefalu *et al.*, 2015).

The (World Bank 2021) posited that agriculture could raise incomes, improve food and nutrition as well as reduce poverty for about 75% of the poor people in the world who reside in rural areas and whose main activity is farming. The need to bridge the nutrient deficiency gap through agriculture led to nutrition-sensitive agriculture (Thompson and Amoroso 2011). Nutrition-sensitive agriculture attempts to increase the production of nutritious, affordable, safe and culturally appropriate foods in the required quantity and quality to ensure the sustainability of the growing populace (Ruel *et al.*, 2018). It focuses on rich, fortified and dietary diversity that alleviates micronutrient deficiency (Galani *et al.*, 2020). It has been established that extension agents can efficiently disseminate information and knowledge on maternal and child healthcare, first aid treatment, education on hygiene and sanitation as well as promotion of nutrition-sensitive information (Adefalu *et al.*, 2017).

Efforts have also been made to integrate nutrition content into the mandates of agricultural training institutions with the expectation that advisory workers are important agents in transmitting agricultural and nutrition knowledge to farmers and rural people (Dia, 2018). Nandi *et al.* (2018) opine that agricultural extension and advisory workers can adequately fit into disseminating nutritional education roles to farmers and rural people through various participatory methodologies and bio-fortification sensitization programs. However, the

competencies of extension agents in Kwara State in delivering nutrition-sensitive extension remains unknown. Against this background, this research sought to answer the following questions; what is the knowledge level of the extension agents in delivering nutrition-sensitive extension in Kwara State? What are the sources of information of the extension agents on nutrition-sensitive extension? What are the constraints faced by the extension agents in disseminating nutrition-sensitive extension? What relationships exist between respondents' socio-economic characteristics and their knowledge level in nutrition-sensitive extension delivery?

MATERIALS AND METHODS

Study area: The study was carried out in Kwara State with a total population of 3,192,893 (NBS 2017), and it is located between latitude 7° 45'N to the south, latitude 2° 45'E to the west, and longitude 6° 40'E to its south-eastern part. About 80% of the state's population lives in rural areas, most of whom are farmers (Yusuf *et al.*, 2016). Crops largely grown in the state include yam, cassava, maize, beans, plantain, sugarcane, rice, vegetables and fruits. The population of the study comprised all extension agents (EAs) serving under Kwara State Agricultural Development Programme (KWADP), which are spread across the four ADP zones, namely; Zone A (Kaiama), Zone B (Pategi), Zone C (Moro) and Zone D (Igbaja). All 120 EAs in the four ADP zones were selected for this study. A questionnaire was used to elicit information from the respondents. Face and content validity were used to determine the instrument's appropriateness, while the test re-test method was used to verify the instrument's reliability. Descriptive statistics were used to analyze socio-economic characteristics while a 3, 4 & 5-point Likert-type scales were used to calculate means of preferred sources of information, knowledge on nutrition, teaching methods and constraints facing the extension agents. These variables were ranked to determine the highest and lowest means. The determinants of the extension agents' knowledge of the nutrition-sensitive extension were analyzed using regression analysis.

RESULTS

Socio-economic characteristics of extension agents: Table 1 showed that the average age of respondents was approximately 41.27 years with the majority (66.7%) being males while 33.3% were females. Almost all (92.5%) of the respondents were married. The result further showed that all the respondents (100%) have formal education; 97% have Bachelor's and National Diplomas and only a few have secondary school leaving certificates (1.7%). It was found that extension agents covered an average of 6,096 farm families with 36.7% of them capturing around 5000 and 10,000 farm families, while 55% covered 5000 or less



families. The extension agents in the study fall within the mid-career level in the civil service grading system (Grade 9 of 16), with the majority (77.5%) of them within an average grade range of 7-10. Further, the years of experience of extension agents were 10, with 48.3% having 6-10 years of experience on average. On training, 64.2% of the EAs had attended workshops on extension service and the average distance covered by the extension agents from their houses to farms or households was 3.72 km.

Table 1. Extension agents' socio-economic characteristics (n=120).

Variables	Frequency	Percentage	Mean
Age (years)			
≤ 30	2	1.7	
31-40	62	51.6	41.27
41-50	48	40.0	
> 50	8	6.7	
Sex			
Female	40	33.3	
Male	80	66.7	
Marital status			
Married	111	92.5	
Divorced	2	1.7	
Widowed	2	1.7	
Single	5	4.2	
Educational Level			
Secondary school	2	1.7	
National Diploma	14	11.2	
Higher National Diploma	33	27.5	
Bachelor's Degree	71	59.2	
Farm families covered			
< 5000	66	55.0	
6000- 10,000	14	36.7	6096.66
>10,000	10	8.0	
Grade Level			
≤ 6	6	5.0	
07-Oct	93	77.5	9.12
>10	21	17.5	
Years of Experience			
≤ 5	15	12.5	
06-Oct	58	48.3	10.12
Nov-15	33	27.5	
>15	14	11.7	
Workshop on Nutrition			
Yes	77	64.2	
No	43	35.8	
Distance Covered (km)			
≤ 5	98	81.7	
5.01 – 15	2	16.7	3.72
>15	2	1.7	

Source: Field Survey: 2021

Extension agents' preferred sources of information: Table 2 showed the preferred source of information by the extension agents. It was demonstrated that personal experience was ranked the most preferred source of information for extension agents while the agents relied on agricultural institutes,

colleagues, seminars and fortnight training sessions for information.

Table 2. Distribution of extension agents based on preferred sources of information (n=120).

Information sources	NP(%)	P (%)	MP (%)	Mean	Rank
Personal experience	4.2	49.2	46.7	2.42	1st
Agricultural Research Institutes	0.8	64.2	35.0	2.34	2nd
Other Extension Agents/Colleagues	5.0	55.8	39.2	2.34	3rd
Forth-night Training Sessions	2.5	61.7	35.8	2.33	4th
Seminar/Conferences/Workshops	14.2	41.7	44.2	2.30	5th
On-the-Job Specialized Trainings	5.0	65.0	30.0	2.25	6th
Extension Publications/Bulletins	3.3	75.8	20.8	2.17	7th
Television	11.7	59.2	29.2	2.17	7th
Immediate supervisor	0.8	82.5	16.7	2.15	9th
Non-Governmental Organization	5.0	78.3	16.7	2.11	10th
Radio	8.5	75.8	15.8	2.07	11th
Personal Quest for knowledge	10.0	73.3	16.7	2.06	12th
Journals	14.2	66.7	19.2	2.05	13th
Local News Agency	15.8	69.2	15.0	1.99	14th
Internet	14.2	74.2	11.7	1.97	15th
Local Business Organization	27.5	52.5	20.0	1.92	16th

NP: Not Preferred, P: Preferred, MP: Most Preferred

Source: Field Survey (2021)

Extension agents' knowledge level on nutrition: In Table 3, it was shown that the knowledge level of the extension agents on nutrition was high, with a mean score of more than 3 in all the knowledge statements. They strongly agreed that meat, fish, eggs and beans are good sources of essential nutrients and that soya bean is a rich source of protein. They also recognized that tomatoes and carrots, as vegetables, are high in calcium. They are also fully aware that cereals serve as a complimentary meal for lactating mothers when mixed with groundnut, while they equally strongly agreed that orange-fleshed potato is a cheap source of vitamin A (ranked 8th) and foods rich in vitamin D helps reduce rickets in children (ranked 7th).

Extension agents' preferred teaching methods on nutrition: Table 4 showed that the extension agents indicated group contact teaching methods as the most effective on nutrition-sensitive extension service delivery (ranked 1st) to rural people in the community.

Constraints to nutrition-sensitive extension services: Table 5 highlighted the various constraints to nutrition-sensitive extension services to the rural communities; insufficient number of extension personnel ranked 1st and was the most severe constraint highlighted, even where extension staff were available, inadequate mobility (ranked 2nd) and this threatens nutrition-sensitive extension service



Table 3. Knowledge level of extension agents on nutrition.

Nutrition knowledge statement	SD (%)	D (%)	U (%)	A (%)	SA (%)	Mean	Rank
Meat, fish, eggs, and beans are good protein sources	0.0	0.0	4.2	26.7	69.2	4.65	1st
Soya bean is a protein source	0.0	1.7	4.2	25.8	68.3	4.60	2nd
Tomato and carrot are rich in Calcium	0.0	1.7	10.0	20.0	68.3	4.55	3rd
Cassava can be processed to cake and tapioca	0.0	1.7	4.2	31.7	62.5	4.53	4th
<i>Ekuru</i> is a good protein source	0.0	0.0	5.0	36.7	58.3	4.53	4th
Orange, melon and pears taken together aid digestion	0.0	0.8	8.3	36.7	54.2	4.44	6th
Foods rich in Vitamin D help reduce rickets in children	0.0	0.0	10.0	40.0	50.0	4.40	7th
Orange fleshed potatoes are a cheap Vitamin A source	0.0	0.0	22.5	33.3	44.2	4.21	8th
Mixing maize and sorghum with groundnut compliments lactating mothers' food	2.5	4.2	114.2	28.3	60.8	4.20	9th
A lack of Iron in the diet can lead to fatigue, injury, and illness	2.5	4.2	4.2	28.3	50.8	4.20	9th
Sweet potato can be processed to <i>Kunu</i> which has a high nutritional value	0.0	1.7	20.0	42.5	35.8	4.12	11th
Boiling sweet potato with its flesh makes it rich in potassium, which boosts the bone health of rheumatic patients	0.0	10.0	7.5	48.3	34.2	4.06	12th
Egg is a source of iodine in human diets	1.7	21.7	4.2	29.2	43.3	3.90	13th
<i>Beske</i> cheese is a good calcium source which enhances a healthy bone development in children and growing adults	0.0	22.5	11.7	22.5	43.3	3.86	14th
Fish is a source of Vitamin D	1.7	25.0	5.0	35.8	32.5	3.72	15th

SD= Strongly Disagree, D= Disagree, U= Undecided. A=Agree, S.A= Strongly Agree

Source: Field Survey, 2021

delivery. Poor working environment coupled with inadequate organizational support in acquiring knowledge on nutrition are constraints to nutrition-sensitive extension service delivery. Lack of training incentives such as funding for acquiring knowledge on crop and family nutrition advisories and lack of nutrition subject-matter specialists pose a potent threat to effective nutrition-sensitive extension service delivery in the study area.

Table 4. Preferred teaching methods on nutrition (n=120).

Constraints	NE (%)	E (%)	VE (%)	Mean	Rank
Group contacts				2.45	1st
Lecture	3.3	52.5	44.2	2.40	
Demonstration	0.8	40.0	59.2	2.58	
Group discussion	0.8	43.3	55.8	2.55	
Exhibition	7.5	51.7	40.8	2.33	
Farmers' day	0.0	39.2	60.8	2.60	
Conference	9.2	47.5	43.3	2.34	
Meetings	0.0	57.5	42.5	2.42	
Workshops	5.8	42.5	51.7	2.45	
Individual contact				2.09	2nd
Telephone calls	26.7	35.8	37.5	2.10	
Personal letters	42.5	43.3	14.2	1.71	
Farm and home visits	6.7	29.2	64.2	2.57	
Office calls	11.7	75.8	12.5	2.00	
Mass contact				1.74	3rd
Radio	28.3	45.0	26.7	1.98	
Television	32.5	39.2	28.3	1.95	
Literature	35.0	53.3	11.7	1.76	
Film show	40.0	50.8	9.2	1.69	
Newspapers	33.3	59.2	7.5	1.74	
Magazines	43.3	51.7	5.0	1.61	
Posters	43.3	47.5	9.2	1.65	
Computers	43.3	55.8	0.8	1.57	

NE: Not Effective, E: Effective, VE: Very effective

Source: Field survey (2021)

Table 5. Constraints for effective extension services on nutrition.

Constraints	NS (%)	MS (%)	S (%)	VS (%)	Mean	Rank
Insufficient number of extension personnel	0.0	17.5	17.5	65.0	3.47	1st
Inadequate mobility of staff	0.0	20.8	45.8	33.3	3.12	2nd
Poor linkages between extension and food nutrition experts	0.8	29.2	42.5	27.5	2.96	3rd
Poor access to information on nutrition	0.8	28.3	47.5	23.3	2.93	4th
Lack of training incentives	0.0	45.8	25.8	28.3	2.82	5th
Inadequate organizational Support	1.7	33.3	46.7	18.3	2.81	6th
High cost in acquiring knowledge on nutrition	10.8	21.7	53.3	14.2	2.70	7th
Poor working environment	7.5	35.8	40.0	16.7	2.65	8th
Lack of nutrition subject matter specialist	15.8	31.7	39.2	13.3	2.50	9th
Inadequate inclusion of nutrition strategies into curriculum	5.8	51.7	29.2	13.3	2.50	9th
Insufficient time	24.2	21.7	48.3	5.8	2.35	11th

N.S=Not Severe, M.D=Moderately Severe, S=Severe, V.S=Very Severe

Source: Field Survey, 2021

Relationship between socio-economic characteristics and knowledge level on nutrition-sensitive extension: Results in Table 6 showed the regression analysis to identify determinants of knowledge level on nutrition-sensitive



extension services to rural communities in the study area. The regression model with six predictors produced a low R square value of $R^2 = 0.468$, $P < 0.05$. The adjusted R-square value was 0.468, which implies that the significant independent variable "age" accounted for about 46.8% of the variations in the extension agents' knowledge level on nutrition-sensitive extension services to the rural communities.

Table 6. Socio-economic characteristics of extension agents and their knowledge level of nutrition.

Socio-economic characteristics	Coefficients			
	Beta	SE	t-value	Sig.
Constant	3.030	0.257	11.79	0.000
Age	0.027**	0.003	10.31	0.000
Marital status	-0.015	0.085	-0.18	0.858
Years of experience	-0.005	0.010	-0.50	0.617
Grade Level	0.015	0.023	0.64	0.521
No of families	0.003	0.004	0.94	0.349
Distance covered	0.001	0.008	0.14	0.893

$R^2 = 0.495$, Adjusted $R^2 = 0.468$, ** $P < 0.05$; SE = Std. Error

Source: Field Survey, 2021

DISCUSSION

Socio-economic characteristics of extension agents: the majority was within active ages meaning that the extension agents are of the requisite age to perform their duty. It was found in another study that the average age of extension agents was in a similar range of 41 years ([Ajayi et al., 2013](#)). That the extension agents were married (92%) further showed their commitment to family responsibilities, which has an implication on nutrition. There are more male extension professionals than females in the study area and this result is similar to that of [Babasanya et al. \(2020\)](#), who submitted that extension professionals in the southwest of Nigeria were males. The result also indicated that all the respondents have formal education, noting that this could influence their knowledge level on nutrition-sensitive extension service delivery as identified by [Sheriff et al. \(2020\)](#), who affirmed that extension agents' level of education plays a huge role in their performance while a substantial number of extension agents in another study advocated for teaching and advisory services ([Aderinoye-Abdulwahab et al., 2019](#)) for the agents to help their clients better. The average number of farm families covered by the respondents was 6,096, a rather large number which is contrary to the FAO recommendation of 1 EA to 800 farmers. The ratio of EA-farm families could negatively influence the effectiveness in nutrition-sensitive extension service as noted by [Akinfenwa \(2018\)](#). The respondents are middle to senior-level staff members, therefore, it is necessary to provide them with access to requisite know-how in extension service delivery. Several years of experience could be useful in dealing with fellow adults in the farm families while discharging their duties. On

training, attendance at workshops on extension service delivery and proximity to farm households will enhance extension service delivery.

Extension agents' preferred sources of information: the result implied that extension professionals in the study area relied more on conventional information sources than the various contemporary information sources like the ICT. On the contrary, it was posited that EAs in the southeast use both traditional and contemporary ICTs ([Ezech, 2013](#)), while ([Babasanya et al. \(2020\)](#)) also found that the majority of extension experts in southwestern Nigeria depended on the use of ICT as the most preferred source of information.

Extension agents' knowledge level on nutrition: on the knowledge of nutritious meals, extension agents are aware that nutrient adequacy is an essential element of children's diets and that supplements and micronutrients are added to meals to improve the general nutrient level of both the infant and the mother. [Neela and Fanta \(2019\)](#) have identified that orange-fleshed sweet potatoes are grown by poor people and consumed by women households due to their cheap but rich nature. According to ([Jones et al. \(2017\)](#)), children lack the required exposure to sunlight while those who are introduced to an early complimentary feeding run the risk of low vitamin D associated with rickets. The respondents agreed that lack of iron in diets could result in fatigue, injury and illness and it has been reported that micronutrient deficiency has been a major issue in public health ([Lockyer et al. 2018](#)); however, the agents indicated that meat, fish, eggs, tomatoes and other greens could boost the nutrient level of households.

Extension agents' preferred teaching methods on nutrition: on teaching methods, this may be partly due to the participatory nature of the group contact teaching method. This method has been said to enhance feedback and has the benefit of passing information to a group of people simultaneously and at a reduced cost. Findings show that the extension agents used all eight methods categorized under group contact method; lecture, demonstration, group discussion, exhibition, farmers' day, conference/general, meetings, and workshops. The findings are in agreement with the findings of [Surudhi et al. \(2017\)](#), where it was pointed out that group meetings are the most used and effective means of contact in extension teaching.

Constraints to nutrition-sensitive extension services: The findings corroborated the position of [Kagbu and Issa \(2017\)](#) but added that the absence of legislated policy is the most important issue hindering quality extension service in rural communities. [Agube et al. \(2021\)](#) also reported in a similar finding that lack of funding for extension services, inadequate number of extension agents and lack of logistics for field staff were severe constraints militating against effective extension service delivery. In another study, it was reported that an extension agent's knowledge of the culture and environment enhances its effectiveness ([Aderinoye-Abdulwahab et al., 2019](#)).



Relationship between socio-economic characteristics and knowledge level on nutrition: the result expressed a positive and significant relationship ($b= 0.027$ $p<0.05$) between age and knowledge level of extension agents on nutrition-sensitive extension services to rural communities. This implied that age reflected the extension agents' knowledge, meaning that an older extension agent demonstrated more knowledge of nutrition-sensitive extension services, while this report is similar to other findings (Owoade and Akinwale, 2019).

Conclusion: The EAs in Kwara State have a high knowledge level in protein foods, calcium foods, the processing of cassava into varieties of nutritious food and vitamin food sources. They knew little about nutritionally prepared food, food sources of iodine and vitamin D and cheap protein sources. This means that there exists a gap that must be filled to ensure a nutrition-sensitive extension for the rural communities. However, their most preferred sources of information were personal experience, agriculture research institutes, other EAs or colleagues, fortnight training meetings, seminar, on-the-job training and extension publications and bulletins. Their most preferred teaching method was group meetings; insufficient number of EAs, inadequate staff mobility, poor EA-nutrition expert linkage, poor access to information on nutrition and lack of training incentives are constraints facing the agents. Age was a determinant of their knowledge of nutrition-sensitive extension. It is expected that the identified information should be improved as this will surely enhance nutrition-sensitive extension service in the state.

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REFERENCES

Adefalu, L.L., O.M. Awoete, S.A. Aderinoye-Abdulwahab and B.A. Issa. 2017. Perception of community health extension services among women in a rural community in Ilorin East, Kwara State, Nigeria. Journal of

Community Medicine and Primary Health Care 29:74-83.

Adefalu, L.L., S.A. Aderinoye-Abdulwahab, M.B. Aliwajud-Adewusi, O.P. Olabanji and E.M. Adebawale. 2015. Influence and consumption pattern of dairy products on nutritional and health development of school-aged children in Ekiti Local Government Area of Kwara State, Nigeria. Sains Humanika 4:23-27.

Aderinoye-Abdulwahab, S. A., M.B. Alwajud-Adewusi, L.L. Adefalu, J.J. Chimgonda-Nkhoma, F.O. Oladipo, and G.B. Adesiji. 2019. Effective extension service delivery to pastoralist women: a challenge for extension education practice in Nigeria. Equity Journal of Science and Technology 2:66-73.

Agube, E.I., E.M. Igbokwe, and O.F. Ojo. 2021. Role of extension forest officers in forest conservation in Cross River State, Nigeria. Journal of Agricultural Extension 25:69-80. <https://doi.org/10.4314/jae.v25i3.7>.

Ajayi, A.O., O.S. Alabi and T.O. Akinsola. 2013. Knowledge and perception of extension agents on information and communication technologies (ICTs) use in extension service delivery in Ondo State, Nigeria. African Journal of Agricultural Research 8:6226-6233. DOI: 10.5897/AJAR2012.7061.

Akerele, D., S. Momoh, A.B. Aromolaran, C.R.B. Oguntona and A.M. Shittu. 2013. Food insecurity and coping strategies in southwest Nigeria. Springer Science + Business Media Dordrecht and International Society for Plant Pathology. pp. 407-414.

Akinfenwa, G. 2018. Extension agents grossly inadequate to deliver services to farmers. <https://guardian.ng/saturday-magazine/cover/extension-agents-grossly-inadequate-to-deliver-services-to-farmers/#:~:text=In%20Nigeria%2C%20the%20effort%20is,that%20are%20working%20in%20states>.

Babasanya, B., M.O. Akinola, N.M. Saddiq, O.M. Ojeleye, M.B. Usman, L. Ganiyu and M.M. Olorukooba. 2020. Determinants of use of social media platforms among extension professionals in southwest, Nigeria. Asian Journal of Agricultural Extension, Economics & Sociology 1-7. <https://doi.org/10.9734/ajaees/2020/v38i1130444>.

Dia, L. 2018. The integration of nutrition into agricultural training institutions. Integrating gender and nutrition within agricultural extension services: case studies and discussion paper September 2018. https://ingenae.illinois.edu/wp-content/uploads/ING-DP-and-CS-2018_09-Integrating-Nutrition-Modules-in-ATIs-Dia-Kuyper.pdf.

Enemuoh, E.U. 2013. Improving the reproductive health status of rural women of Umunze in Orunba South of Anambra State, Nigeria. Mediterranean Journal of Social Sciences 4:2039-2117.



Ezeh, A.N. 2013. Extension agents' access and utilization of information and communication technology (ICT) in extension service delivery in southeast Nigeria 5:266-276. DOI: 10.5897/JAERD2013.0511.

FAO. 2013. Synthesis of guiding principles on agriculture programming for nutrition. <https://www.fao.org/3/aq194e/aq194e.pdf>

FAO. 2014. FACT SHEET: Nutrition-sensitive agriculture. ICN2 Second International Conference on Nutrition; better nutrition, better lives. 19-21 November 2014, Rome, Italy. <http://www.fao.org/about/meetings/icn2/preparations/document-detail/en/c/238665/>

FAO. 2015. The economic lives of smallholder farmers an analysis based on household data from nine countries. Food and Agriculture Organization of the United Nations Rome, 2015. <https://www.fao.org/3/i5251e/i5251e.pdf>

FAO. 2017b. Nutrition-sensitive agriculture and food systems in practice: options for intervention. Food and Agriculture Organization of the United Nations Rome. <https://www.fao.org/3/I7848E/I7848E.pdf>

FAO, IFAD, UNICEF, WFP and WHO. 2019. The state of food security and nutrition in the world. Safeguarding against economic slowdowns and downturns. Rome, FAO. Licence: CC BY-NC-SA 3.0 IGO

FAO. 2017a. The future of food and agriculture- Trends and challenges. Rome. <https://www.fao.org/3/i6583e/i6583e.pdf>

Grosso, G., A. Mateo, N. Rangelov, T. Buzeti, and C. Birt. 2020. Nutrition in the context of the sustainable development goals. European Journal of Public Health 30:119-123. <https://doi.org/10.1093/eurpub/ckaa034>

Gödecke, T., A.J. Stein, & M. Qaim. 2018. The global burden of chronic and hidden hunger: Trends and determinants. Global Food Security 17:21-29. <https://doi.org/10.1016/j.gfs.2018.03.004>

Galani, Y.J.H., C. Orfila and Y.Y. Gong . 2020. A review of micronutrient deficiencies and analysis of maize contribution to nutrient requirements of women and children in Eastern and Southern Africa. Critical Reviews in Food Science and Nutrition 62:1-24. <https://doi.org/10.1080/10408398.2020.1844636>.

Heinz, K. 2018. Competency framework for extension, nutrition and gender integration. <https://agrilinks.org/post/competency-framework-extension-nutrition-and-gender-integration>.

Heltberg, R. 2009. Malnutrition, poverty, and economic growth. Health Economics 18:S77-S88.

Jones, K.D.J., C.U. Hachmeister, M. Khasira, L. Cox, I. Schoenmakers, C. Munyi, H. Nassir, B. Hünten-Kirsch, A. Prentice and J.A. Berkley. 2017. Vitamin D deficiency causes rickets in an urban informal settlement in Kenya and is associated with malnutrition. Maternal and Child Nutrition 14:12452.

Kagbu, J.H. and F.O. Issa. 2017. Challenges of extension delivery in improving agricultural productivity in Nigerian rural economy: critical issues. Nigerian Journal of Agricultural Extension 18:53-60

Lassi, Z., A. Moin, and Z. Bhutta. 2017. Nutrition in middle childhood and adolescence: *Disease control priorities*. Child and Adolescent Health and Development 8:133-146. https://doi.org/10.1596/978-1-4648-0423-6_ch11.

Lockyer, S., A. White, and J.L. Buttriss. 2018. Biofortified crops for tackling micronutrient deficiencies - what impact are these having in developing countries and could they be of relevance within Europe? *Nutrition Bulletin* 43:319-357. <https://doi.org/10.1111/nbu.12347>

Matemilola, S. and I. Elegbede. 2017. The challenges of food security in Nigeria. OALib.s 04:1-22. <https://doi.org/10.4236/oalib.1104185>

Musah, K.T and O.O. Kayode. 2014. Preliminary assessment of healthcare seeking behavior among users of primary healthcare in Ilorin metropolis, Kwara State, Nigeria. IOSR Journal of Nursing and Health science 3:31-35.

Nandi, R., N. Vishwanath and G. Muttanna. 2018. Agricultural extension through nutrition.sensitive lens: Potential of fruits and vegetables as a source of nutrition. Indian Journal of Agricultural Sciences 9:945-950.

National Bureau of Statistics (NBS). 2017. Demographic Statistics Bulletin. Federal Republic of Nigeria. May, 2018.

Neela, S. and S.W., Fanta. 2019. Review on nutritional composition of orange-fleshed sweet potato and its role in management of vitamin A deficiency. Food Science & Nutrition 7:1920-1945.

Owoade, E. O. and J.A. Akinwale. 2019. Poultry farmers' perceptions of extension service delivery through input providers in Ogbomoso zone of Oyo State, Nigeria. South African Journal of Agricultural Extension (SAJAE)47(1):36-44 <https://doi.org/10.17159/2413-3221/2019/v47n1a487>.

Ruel, M. T., A.R. Quisumbing and M. Balagamwala. 2018. Nutrition-sensitive agriculture: What have we learned so far? Global Food Security 17:128-153. <https://doi.org/10.1016/j.gfs.2018.01.002>

Siddiqui, F., R.A. Salam, Z.S. Lassi and J.K. Das. 2020. The intertwined relationship between malnutrition and poverty. Frontiers in Public Health 28:8453 <https://doi.org/10.3389/fpubh.2020.00453>.

Sheriff, S. Y., H. Sule, B.Z. Abubakar, M.A. Maikasuwa and F.I. Agbomakha. 2020. Challenges militating against the effectiveness of knowledge management in sustainable land use and agricultural production among extension workers in Sokoto State, Nigeria. Agricultural Sciences 11:912-920.

Surudhi, M., M. Asokhan and R. Arunachalam. 2017. Utilization pattern of extension tools and methods by



agricultural extension agents. *Journal of Extension Education* 29:5838.

<https://doi.org/10.26725/jee.2017.2.29.5838-5849>.

Tochukwu, O. B. 2022. Micronutrient deficiency among Nigerian population: the hidden hunger. *International Academic Journal of Medical and Clinical Practice* 17:1-14.

Thompson, B. and L. Amoroso. 2011. FAO's Approach to nutrition-sensitive agricultural development. FAO, Rome 2011. Available at:
https://www.fao.org/fileadmin/user_upload/agn/pdf/FAO_Approach_to_Nutrition_sensitive_agricultural_development.pdf

UN. 2016. Goal 2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture
<https://unstats.un.org/sdgs/report/2016/goal-02/>

WHO. 2020. Food Safety. <https://www.who.int/news-room/fact-sheets/detail/food-safety>

World Bank. 2021. Agriculture and Food. Available at: <https://www.worldbank.org/en/topic/agriculture/overview>.

World Health Organization, United Nations Children's Fund (UNICEF) & World Bank. 2021. Levels and trends in child malnutrition: UNICEF / WHO / The World Bank Group joint child malnutrition estimates: key findings of the 2021 edition. World Health Organization. <https://apps.who.int/iris/handle/10665/341135>

Yusuf T.M., S.A. Tiamiyu and R.O. Aliu 2016. Financial analysis of poultry production in Kwara State, Nigeria. *African Journal of Agricultural Research* 11:718-723.

